DOCUMENT RESUME

ED 123 533 CG 010 570

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TITLE Relative Efficacy of Two Token Economy Procedures for Decreasing the Disruptive Classroom Behavior of Retarded Children.
PUB DATE [74]
NOTE 32p.

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Behavior Change; *Change Strategies; Discipline Problems; Learning Theories; Misbehavior; *Problems; Program Effectiveness; *Reinforcement; Reinforcers; Research Projects; *Retarded Children; *Rewards; Special Education
IDENTIFIERS *Token Economy

ABSTRACT

Numerous studies have demonstrated that disruptive classroom behavior can be decreased by delivering tokens contingent on periods of time during which children do not engage in it or by removing tokens contingent on its occurrence. To date, the best controlled of these studies have consistently reported the two procedures to be equally effective. However, the effects of the token contingencies have been confounded with those of instructions. The present study compared these two procedures when no instructions were given regarding the token contingencies. Token delivery was not effective in decreasing disruptive behavior in any of the children, while a combination of token delivery and removal was effective for three of four children. The results suggest that the combined procedure may be effective with certain populations that are not readily controlled by instruction. (Author)

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ED123533

Relative Efficacy of Two Token Economy Procedures for Decreasing the Disruptive Classroom Behavior of Retarded Children

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Abstract

Numerous studies have demonstrated that disruptive classroom behavior can be decreased by delivering tokens contingent upon periods of time during which children do not engage in it or by removing tokens contingent upon its occurrence. To date, the best controlled of these studies have consistently reported the two procedures to be equally effective. However, the effects of the token contingencies have been confounded with those of instructions. The present study compared these two procedures when no instructions were given regarding the token contingencies. Token delivery was not effective in decreasing disruptive behavior in any of the children, while a combination of token delivery and removal was effective for three of four children. The results suggest that the combined procedure may be effective with certain populations that are not readily controlled by instruction.

Relative Efficacy of Two Token Economy Procedures for Decreasing the Disruptive Classroom Behavior of Retarded Children

Numerous studies have demonstrated that token economy procedures can be employed as an effective means for modifying a variety of behaviors in the classroom (cf. O'Leary and Drabman, 1971). Disruptive behavior is one important category of behavior to which such procedures have been applied. In general, where attempts have been made to decrease disruptive classroom behavior, token contingencies have been arranged in one of two ways.

1. Token Delivery - Tokens are delivered contingent upon periods of time during which children engage in little or no disruptive behavior (e.g. O'Leary and Becker, 1967) or contingent upon some behavior assumed to be incompatible with disruptive behavior (e.g. Ayllon and Roberts, 1974).

2. Token Removal - Tokens are removed contingent upon the occurrence of disruptive behavior (e.g. Sulzbacher and Houser, 1968).

Several studies have attempted to assess the relative efficacy of token delivery and token removal procedures in decreasing disruptive classroom behavior. McLaughlin and

Malaby (1972) found the token delivery procedure to be much more effective than the token removal. However, they noted that during the token removal phase of their study, the teacher attended to the children's disruptive responses by directing them to remove points from their point charts. No attention was paid to disruptive behavior during the token delivery phase. They suggest that the teacher's attention to disruptive behavior during the token removal phase may have been responsible for maintaining it. In contrast, Kaufman and O'Leary (1972) and Gregory (1972) in studies which controlled for the effects of teacher attention found token delivery and token removal procedures to be equally effective in decreasing disruptive behavior.

In the aforementioned studies comparing token delivery and token removal procedures, the children were given instructions regarding the contingencies. They were told when and why tokens would be delivered or removed. Thus, the effects of the token contingencies were confounded with the effects of the instructions regarding them. The present study sought to compare the effectiveness of token delivery with combined token delivery and removal when children were given no instructions regarding the contingencies.

Method

Subjects

Four children enrolled in special education classes at the University Affiliated Exceptional Child Center on the Utah State University campus served as subjects. They ranged in age from 6 years, 11 months to 12 years, 6 months with a mean age of 9 years, 8 months. Their IQs ranged from 55 to 72 with a mean of 63.

Two criteria were used in selecting the children. (1) They had to be at approximately the same level in the Distar Math (Engleman & Corine, 1969) program. (2) Their teacher reported that she felt they engaged in high rates of disruptive behavior during lessons. Four children were identified and assigned to one of two groups depending upon when they could be released from regular classes.

Experimental Setting

Both groups of children worked in a small room away from their regular classrooms. The room contained a chair for the teacher and two chairs for the children. Two bowls were placed on a small table between the children and teacher. Tokens (poker chips) were delivered into or removed from the bowls by the teacher at appropriate times. A blackboard on the teacher's left was used for presenting arithmetic exercises. Several other chairs were situated to the teacher's right for observers.

Preliminary Observations and Definition of Disruptive Behavior

Preliminary sessions were run with Groups I and II (four and two sessions respectively) to: (1) adapt the children to the experimental setting and presence of observers, (2) allow the teachers and observers to familiarize themselves with the experimental procedures, (3) allow the experimenter to introduce the children to the token exchange procedures and establish the tokens as conditioned reinforcers, and (4) allow the experimenter to observe the children and formulate definitions of behaviors to be considered disruptive.

Separate definitions of behaviors considered to be disruptive were formulated for each child. The behaviors were chosen because they occurred in at least 35 percent of the observation intervals during preliminary sessions. Table 1 lists the behaviors defined as disruptive for each child.

The definition formulated for AT presented some special problems. During preliminary observations, AT's disruptive behavior met the 35 percent minimum criterion. However, five additional behaviors had to be added by session 10 in order to maintain the 35 percent criterion during baseline.

Insert Table 1 about here

Observations

Each group was observed for a daily 30 minute session. Three undergraduates, a graduate student in psychology, and on 14 occasions the experimenter, served as observers. In each session, each child was observed during three randomly assigned five minute observation periods. During each observation period, the observer watched the child for 10 seconds and recorded for five seconds. Thus, 60 observations were made of each child during each 30 minute session. A tape was used to cue observers as to when to observe and record. The dependent measure was the percentage of intervals in which disruptive behavior occurred.

During the token delivery and combined token delivery and removal phase, the children were observed during all six five-minute blocks. This was necessary since during these phases the delivery of tokens to the children was contingent upon their not engaging in disruptive behavior for two consecutive observation intervals. The observer recorded whether or not each child engaged in a disruptive response during each of the 120 intervals the session was divided into, and cued the teacher when a token was to be delivered. However, only the data from the five-minute blocks to which the children were randomly assigned were included in the analysis.

Throughout all phases of the experiment, the children were observed periodically by a second observer (at least twice per phase). These observers were aware of the fact that the experimental procedures were designed to decrease the amount of disruptive behavior engaged in by the children. However, they were given no expectations that one procedure would be more or less effective than the other.

Percentages of agreement between the two observers were calculated by dividing the number of intervals in which they agreed that a disruptive response did or did not occur by the total number of intervals.

The mean percent agreement for Group I was 93 (range 84-98) and the mean for Group II was 93 (range 88-97).

Presentation of lessons. Two undergraduate majors in psychology served as teachers. During each session, they presented exercises from the Distar Math book (Engleman and Corine, 1969). These exercises were of three types. One required the children to balance arithmetic problems. The teacher wrote an arithmetic problem with one number missing on the board (e.g. 2 + __ = 4, __ + 5 = 6) and asked the children a series of questions which would lead them to a solution.

The two other types of exercises required the children to count from one number to another (e.g. from 20 to 29), and to identify various numbers, symbols, and objects in the Distar book.

Teacher social approval was held constant throughout all phases of the study. During each session, the observer cued the teacher to give the children noncontingent social approval every two minutes. The approval consisted of the teacher smiling, patting the child, and saying, "good," followed by the child's name. At all other times, the teacher was businesslike in presenting lessons and managing the token contingencies.

Special procedures. Two special procedures were in effect throughout the study, one for GK and one for FS. GK engaged in several responses of long duration (e.g. holding the chalk). So that the teacher had more opportunities to remove tokens during the delivery and removal phase, these responses were broken into more discrete responses by having the teacher physically interrupt them. The procedure implemented for FS involved physically holding him in his chair whenever he tried to leave it. This procedure was necessitated by the fact that at times FS would have left the experimental setting completely had he not been prevented from doing so. In practice, the procedure was used only a few

times during the course of the study.

Token exchange. Immediately after each session, the Ss were allowed to exchange their tokens for a variety of backup reinforcers. These included candy, gum, small toys, and for one S (FS), the opportunity to visit (talk to and play with) the Center's clinical nurse. Ss were taken into the experimenter's office where backup reinforcers were displayed on several bookshleves. They were helped by the experimenter, teacher, and observers to count their tokens into stacks of 10. Candy, gum or a visit to the clinical nurse were exchanged for three stacks and toys were exchanged for five stacks . Ss chose a backup reinforcer from the shelves and then deposited the appropriate number of stacks into a bowl.

The exchange ratio made it possible for a S to obtain as many reinforcers as he had tokens for and still have tokens left. For example, if a S earned 45 tokens during a session and exchanged 30 of them for candy or gum, he would be left with 15 which was not enough to purchase another item. During the first baseline period, Ss were allowed to save these tokens from one session to the next. However, when the first experimental contingencies were introduced, it was noticed that an S could engage in high rates of disruptive behavior, obtain only a few tokens, and by combining these with those he had saved from the day before still have enough to

purchase reinforcers. To prevent this, the rule was established that any tokens which were not exchanged immediately after the session would be forfeited. The Ss were told by the experimenter that their extra tokens could no longer be saved. None of the Ss raised an objection to the introduction of this rule.

Experimental Design

The present experiment was a within-subject study that employed an ABAC counter-balance design. Group I was exposed to four conditions which included baseline, token delivery, baseline, and token delivery and removal. Group II was exposed to the same four conditions but in a different order: baseline, token delivery and removal, baseline and token delivery.

Baseline. The children were given 30 tokens noncontingently at the beginning of each baseline session. During the session, a double tap on the teacher's back every 45 seconds cued him to deliver a token noncontingently to each child. Tokens were always delivered without comment by the teacher.

Token delivery. During the token delivery phase, the children received 10 tokens noncontingently at the beginning of each session. Examination of the frequencies of disruptive behavior during the preceding baseline phase revealed that,

given this number of noncontingent tokens, each child would have to engage in substantially lower frequencies of disruptive behavior during the token delivery phase in order to earn even approximately the number of tokens they had received during the baseline phase.

The observer cued the teacher to deliver a token whenever a child had not engaged in disruptive behavior for two consecutive observation intervals.

Token delivery and removal. Prior to each session during the token delivery and removal phase, the children had a number of tokens placed in their bowls. The number for each child was calculated by examining the baseline data from the preceding phase to determine approximately how many tokens a child would earn and lose during a session if he continued to engage in his present rate of disruptive behavior. Based on these data, an estimate was made of the number of tokens that should be placed in each child's bowl in order to insure: (1) that the teacher would always have tokens to remove, and (2) that the child would be left with less than 30 tokens (less than enough to obtain a backup reinforcer if he continued to engage in the same rate of disruptive behavior as during baseline). The initial estimates proved to be good except in the case of GK, who had to have the number of tokens she was given noncontingently reduced on the fourth session of the phase in

order to meet the two conditions mentioned. During this phase, tokens were delivered as in the token delivery phase and were also removed contingent upon the occurrence of each disruptive behavior.

Stability Criteria

Prior to beginning the experiment, minimum stability criteria were established as a guide for determining when to change from one phase of the experiment to the next. Two criteria were used: (1) children were not moved to a new phase until at least five sessions elapsed, (2) disruptive behavior during the last three sessions could not vary more than 20% from the mean of the last three sessions. However, the experimenter could choose to set more stringent criteria.

Results

The mean percent of disruptive behavior over the last three sessions of each phase was computed for each child. This measure provides an index of the effects of the various contingencies after they were improved for some time. The phase mean averages were: baseline prior to delivery - 56, delivery - 49, baseline prior to delivery and removal - 62, delivery and removal - 30. These data indicate that only the combined delivery and removal contingencies were effective in reducing the frequency of disruptive behavior.

Data for individual children are presented in Figure 1.

Insert Figure 1 about here

The individual data for RM and FS are very similar. They clearly demonstrate the effectiveness of combined delivery and removal contingencies. The delivery contingencies did not decrease the frequency of disruptive behavior below baseline levels. In addition, the combined delivery and removal contingencies were effective irrespective of phase sequence. The data for AT show the same effect although less clearly. This child's percent of disruptive behavior decreased markedly during the token delivery and removal phase relative to the preceding baseline. When the baseline contingencies were reintroduced, AT's percent of disruptive behavior again increased although not to the initial baseline level. Introduction of the delivery contingencies caused an initial increase in the percentage of disruptive behavior which gradually declined to preceding baseline levels. A possibility exists that more sessions may have shown a further decrease. However, the stability criteria were met during the last three sessions of this phase and the phase was terminated.

GK was the only child not affected by any of the experimental contingencies. Her percentages of disruptive behavior did not change markedly across the four phases.

Figure 2 shows the number of tokens each child had to spend at the end of each session plotted over the delivery and combined delivery and removal phases.

Insert Figure 2 about here

Data for the baseline phases are not included as the number of tokens for each child was constant (70). Tokens available to be spent after sessions in the delivery phase never exceeded the baseline number. For the three children who came under the control of the delivery and removal contingencies, the number of tokens available to be spent increased over the baseline level as the percentage of disruptive behavior decreased. GK, who did not come under the control of the contingencies at any time during the experimental phases never had as many tokens to spend as during baseline. In most cases, GK had too few tokens to purchase a reinforcer.

Discussion

The results showed that delivering tokens contingent upon not engaging in disruptive behavior combined with removing tokens contingent on disruptive behavior was effective in decreasing disruptive behavior for three of the four children. In

contrast, delivering tokens contingent on not engaging in disruptive behavior alone did not decrease disruptive behavior. The results pose two questions: (1) What accounts for the difference in results obtained in the present study and those obtained by Kaufman and O'Leary (1972) and Gregory (1972)? (2) Why was GK not affected by the token delivery and removal contingencies?

The major differences between the procedures employed here and those employed by Kaufman and O'Leary (1972) and Gregory (1972) is that in the present study, the children were not instructed about the token contingencies. This difference may account for the differing results. Skinner (1966, pp. 22-24), in an analysis of instructions, points out that they induced individuals to behave in a particular manner by allowing them to discriminate the reinforcement contingencies. Children in the Kaufman and O'Leary (1972) and Gregory (1972) had the benefit of instructions which may have helped them discriminate the reinforcement contingencies; children in the present study did not.

An explanation for the differential results obtained under the two experimental procedures in the present study may be the relative ease with which the two procedures allow the children to discriminate the reinforcement contingencies. During the delivery phase, a token might be delivered after

any one of a large number of unspecified responses. In contrast, during the combined delivery and removal phase, tokens were also removed after each occurrence of a small number of specified responses. Removing tokens in this manner was the only difference in the two procedures. If the differential results are due to the children's ability to discriminate the reinforcement contingencies under the two procedures, the removal contingency or an interaction between the delivery and removal contingencies may have been the critical element in allowing them to make the discrimination.

There is also evidence demonstrating that punishment can facilitate formation of a discrimination. For example, Hamilton (1969) compared four different procedures for teaching a group of nursery school children to discriminate the correct hole of a two-hole marble box in which to drop a marble. One procedure involved saying to the children, "That's right," on 50 percent of the trials in which they dropped the marble in the correct hole. In a second procedure, "That's right," followed correct responses just as in the preceding one, only the children were informed that the researcher would say, "That's right," after some (50 percent) of the times that they made the correct response. The other two procedures were the same except that the children were told, "Wrong," after 50

percent of their errors. Results of the study showed that the best procedure for teaching the discrimination was the "Wrong" uninformed. The worst procedure was the "Wrong" informed, while the "That's right" procedures were in the middle with little difference between them. The best procedure combined lack of instructions with punishment contingencies. Similarly, Penny and Lupton (1961) working with a group of second, fourth and eighth graders compared the effects of teaching a two-choice discrimination using three different procedures. Under one, children making the correct responses were reinforced with a jelly bean, while under another children making an error were punished by delivery of an aversive tone. The third procedure combined the two previous ones. The results showed that children taught the discrimination with punishment alone learned fastest and those taught with both punishment and reinforcement learned faster than those taught with reinforcement alone. Other studies have also shown that learning occurs more quickly under punishment than under positive reinforcement contingencies (cf. Paris and Cairns, 1972 and Karsh and Williams, 1964).

The results of the present study are consistent with Skinner's analysis of the role of instructions and the research cited on teaching discriminations. In the Kaufman

and O'Leary (1972) and Gregory (1972) studies, when tokens were delivered contingent upon periods of time during which children engaged in little or no disruptive behavior, the amount of disruptive behavior decreased, while in the present study, no such decrease was observed. This difference may be accounted for by the fact that in the present study, the children were given no instructions which would allow them to discriminate the reinforcement contingencies. Removing tokens contingent upon the occurrence of disruptive behavior combined with delivering them was effective in decreasing the amount of disruptive behavior exhibited by the children in the present study. Similar procedures were also effective in studies by Kaufman and O'Leary (1972) and Gregory (1972). In the two earlier studies, discrimination of the reinforcement contingencies during the token removal phase may have been facilitated by either instructions, the contingencies themselves, or both. However, in the present study, no instructions were given and it is assumed that the contingencies themselves facilitated such discrimination.

A recent study by Iwata and Bailey (1974) also compared the effects of delivering vs. removing tokens on the social

and academic behavior of retarded children when instructions were given. Their results showed both procedures to be equally effective and are consistent with the above analysis.

One reason why GK may not have come under the control of the contingencies may have been the special procedures implemented for her. GK was the only child to whom the teacher attended when she was engaging in disruptive behavior. When disruptive behavior occurred, the teacher interrupted it by, for example, removing the chalk or eraser from her hand. The teacher's attention may have been reinforcing enough to override the token contingencies and maintain these behaviors in GK. Such an explanation is consistent with the one offered by McLaughlin and Malaby (1972) to account for their finding that delivery tokens produced and maintained lower frequencies of disruptive behavior in a class of fifth and sixth graders than delivering and removing them. In their study during the token removal phase, the teacher attended to each child who engaged in a disruptive behavior by asking that child to remove tokens from his point chart. Another possible explanation lies in a consideration of GK's orientation toward the bowl that tokens were delivered into and removed from, and the conditioned reinforcing properties that might be attributed to the sound of the tokens being dropped in the bowl. During the

first three phases, there was ample opportunity for the sound of the tokens being dropped into the bowl to acquire conditioned reinforcing properties. Also, GK was usually oriented toward the chalkboard so that she was not watching the bowl. During the combined delivery and removal phase when she was thus oriented, the tokens were dropped into a glass behind the bowl when removed. This sound was not appreciably different from the sound made by dropping them into the bowl. If this sound had, in fact, acquired reinforcing properties by being paired with the tokens, then it could have maintained the disruptive behavior exhibited by GK. None of the other children engaged in behaviors that kept them oriented away from their bowls for substantial amounts of time. Finally, another possibility is that the candy, gum, and toys used to back up the tokens were not reinforcing for GK. This is doubtful, however, in light of the fact that during token exchange periods, these backup reinforcers maintained putting stacks of chips into a bowl in this child.

Examination of the number of tokens the children had to spend at the end of each session showed that the children who came under control of the token contingencies during the combined delivery and removal phase earned substantially more

tokens during this phase than during any of the other phases. Again, this is as expected because the token contingencies during the combined token delivery and removal phase were arranged to insure that if the children engaged in less disruptive behavior during this phase, they would earn more tokens than during baseline.

Although the adjustment procedure allowed a sufficient number of tokens to be available for removal, it also increased the potential number of tokens children could spend at the end of the session. This procedure may have enhanced the effect of the removal contingency.

The results of the present study have practical implications for individuals who are not readily controlled by instructions. For example, the token delivery and removal procedure might be applied to the repetitive motor behavior typical of non-verbal autistic children, the excessive activity of hyperactive children or the bizarre speech patterns of certain psychotic populations.

The present study demonstrated the procedure to be effective in decreasing the frequencies of a variety of motor and verbal behaviors in retarded children. This suggests it may be effective with other behaviors in other populations.

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Table 1

Definitions of Disruptive Behaviors for Each Child

Child	Definition
GK	1. Feet on chair - any contact of the feet with the seat or back of the chair, or putting the feet through the holes in the back of the chair. 2. Touching chalk or chalkboard eraser - any contact of the hands with the chalk or chalkboard eraser.
FS	1. Inappropriate comments - any comment not relevant to the lesson being presented by the teacher, persisting in giving a wrong answer after having been told the correct answer by the teacher. 2. Making noise - any audible sound that is not a word or any answer to a question given in a tone of voice other than normal.

RM

1. Giggling - any quick laugh usually accompanied by clasping the hands together and straightening the elbows.
2. Touching another child - contact by any part of the body with the body of another child initiated by the first child.

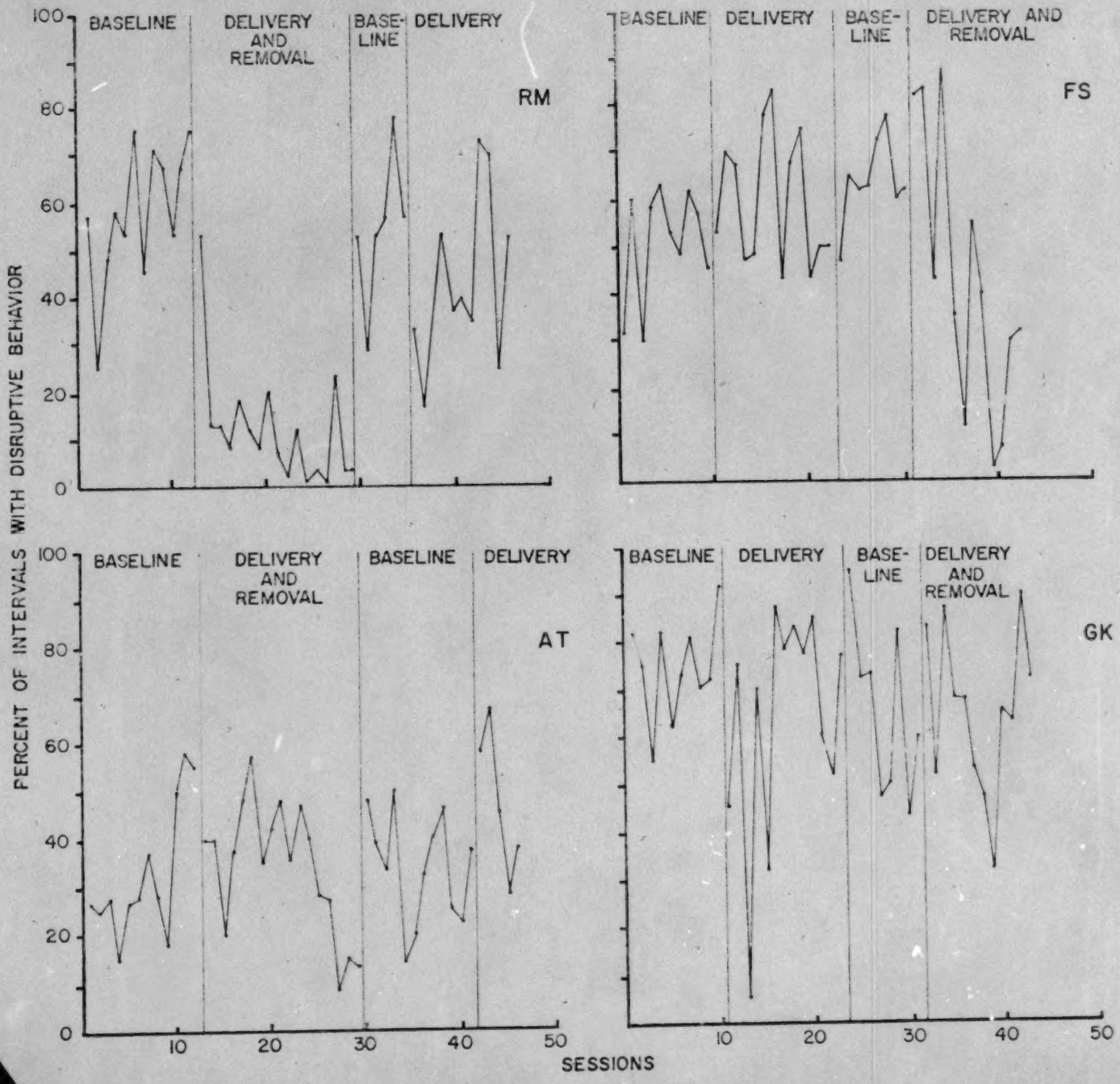
AT

1. Answering out of turn - providing an answer to a question directed toward another child.
2. Touching another child - contact by a part of the body with the body of another child initiated by the first child.
3. Slapping the thighs - sharp contact of the hands with the thighs.
4. Clapping hands - sharp contact of the hands with each other.
5. Looking away from the teacher - any orientation of the head making eye contact with the teacher impossible.
6. Putting fingers in mouth - any contact of the fingers with any part of the mouth past the lips.

Figure Captions

Figure 1. Percent of disruptive behavior exhibited by each child over phases.

Figure 2. Number of tokens available to be spent by each child at the end of sessions during experimental phases. Order of phases for RM and AT is reversed. Question marks indicate lost data points.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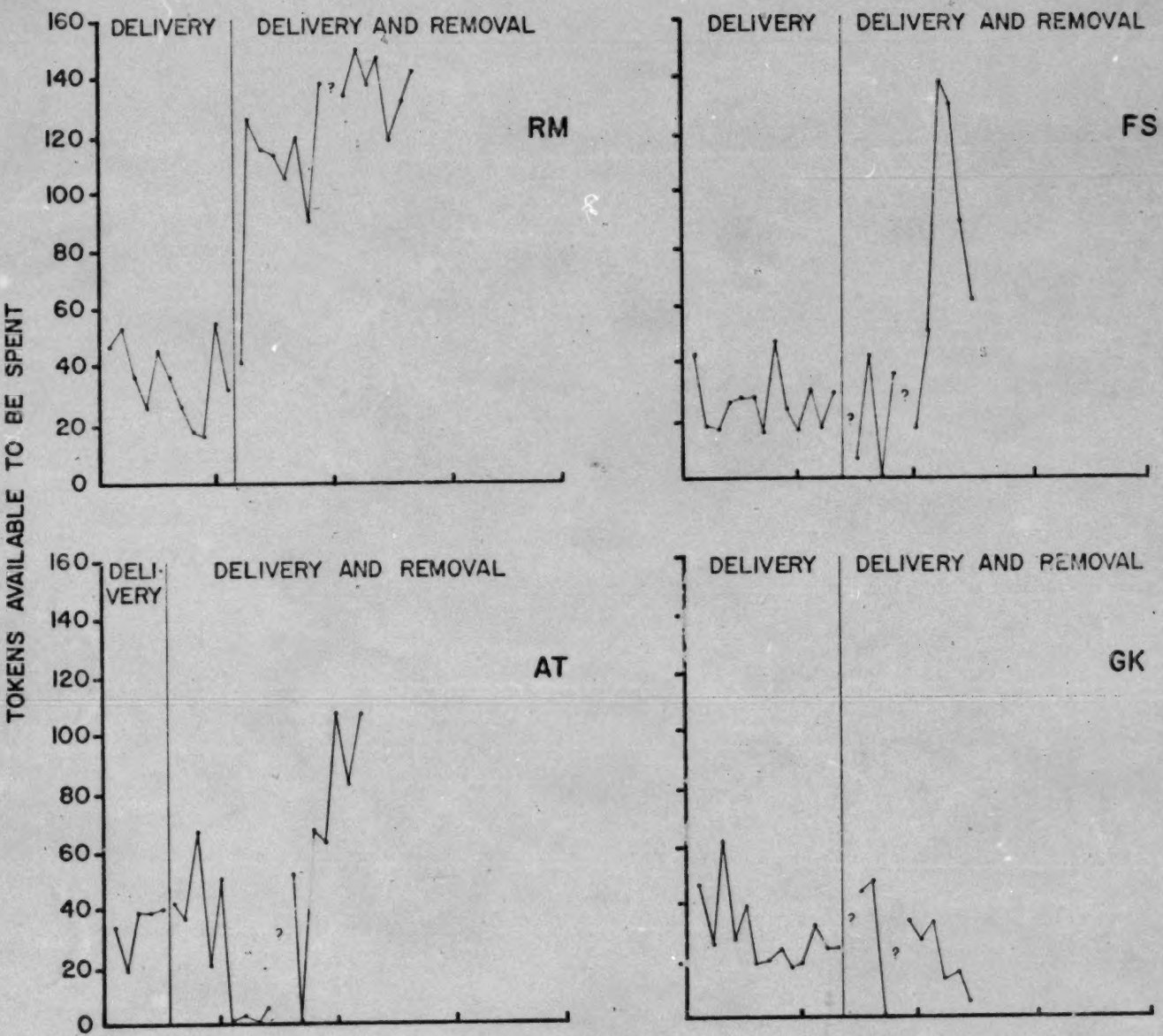
TOKENS AVAILABLE TO BE SPENT
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